

COGNITIVE BIASES IN MILITARY DECISION MAKING

BY

LIEUTENANT COLONEL MICHAEL J. JANSEN
United States Army

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U.S. Army War College, Carlisle Barracks, PA 17013-5050

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CIVILIAN RESEARCH PROJECT

COGNITIVE BIASES IN MILITARY DECISION MAKING

by

Lieutenant Michael J. Janser
United States Army

Nicholas D. Wilson
Program Adviser
Center for Strategic & International Studies

Disclaimer

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U.S. Army War College
CARLISLE BARRACKS, PENNSYLVANIA 17013

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COGNITIVE BIASES IN MILITARY DECISION MAKING

Introduction

Recent research in psychology and behavioral economics has begun to shed light with great specificity on the nature of human decision making. The practical applications of this research has led to increased performance and improved managerial decision making in various industries – particularly those with high stress and high function requirements. This study will address the latest research findings and their applicability to decision making within the Department of Defense by:

- Outlining the military decision making process and its shortcomings;
- Explaining the latest findings on heuristics and cognitive biases;
- Offering military case studies with recommendations for improving the process by which military staff, commanders and senior civilian policymakers make major decisions.

Heuristics

The human mind functions much like a powerful computer. However, it is not unlimited in its processing power. In order to compensate for its limitations, the brain has developed certain short-cuts or rules of thumb called heuristics. These heuristics allow individuals to make quick and reasonably accurate decisions despite time constraints or limited information. These mental processes have developed over the course of human evolution as a means of ensuring survival. Below are three common heuristics.¹

The Availability Heuristic. The availability short-cut supports the premise that the more examples you can recall of a particular situation, the more likely you will believe in its occurrence in the future.² This makes perfect sense and is seemingly in line with proper probabilities. If you live in the dessert where it hasn't rained in a long time, then it is reasonable to believe that it won't rain tomorrow. Someone who lives on a farm that has been bitten by several wild cats but never by the pet dog would be wise to avoid cats. Juxtapose this with someone who lives in a rainforest and expects rain or someone who lives on a different farm that has wild dogs and domesticated cats. These individuals may reach completely logical - but completely opposite - conclusions regarding some third situation such as the safety of certain

pets or the weather in another location. This will occur due to the availability of different experiences that they can recall.

The Representativeness Heuristic. This heuristic entails taking the characteristics of one object or person and applying them to a similar object or person. For example, if you have never personally seen a lion or rattlesnake, but have been trained by your parents to avoid them, then you have benefited from this rule of thumb.³ A college admissions committee may look at certain representative characteristics of applicants such as the nature of their previous school or level of parent income in making admissions decisions. While this rule of thumb will work in many situations it will not work in all. Consider the parents who teach their child to avoid rattlesnakes and/or members of a certain race or religion. These representative characteristics or stereotypes may be significantly off for a number of reasons. In addition, a college admissions committee that has only ever had one student matriculate from a given high school may be in error in assuming that single student is representative of that particular high school and assessing/assuming that the second student will be similar.⁴ The first student may not be an average or representative example of the school. He or she may be the best student that school has ever produced or one of the worst and as such should not be used as a representative example by which to judge others.

The Anchoring Heuristic. The anchoring short-cut relates to how individuals estimate a value. The first or initial guess is the anchor. For example, this year's budget is a good starting point for estimating next year's budget. Next year's budget could be plus or minus a certain percent from this year's. This is a completely logical and useful process. However, it is not infallible. Mistakes are particularly evident when the initial estimate such as the first offer in a salary negotiation or a starting price in a house sale negotiation is offered.⁵ Imagine the exact same house in two different locations – one in an overheated urban market and the other in a depressed rural market. A person moving from the country to the city will feel that the urban house is unjustifiably overpriced while the individual moving from the city to the country will feel that they are getting a steal. Research has shown that individuals' estimates vary greatly concerning the same situation when they are given different initial values - even when those values are randomly generated.⁶

Cognitive Biases

These heuristics have allowed mankind to survive and thrive to this day. However, a shortcut entails not doing everything and thus can result in an answer that is a good fit, but not perfect. Likewise, a rule of thumb is exactly that, a general rule and not a universal truth. While a rule of thumb may result in the correct answer most of the time, it may also result in an incorrect answer a significant portion of the time. Understanding these rules of thumb and their inherent limitations can assist in increasing the effectiveness of the decision making process.⁷ Below are some examples of common cognitive biases that follow from the shortcomings of the heuristics described above.

The Overconfidence Bias. Consider the following questions:

1. What is the average weight of the adult blue whale in pounds?
2. In what year was the Mona Lisa painted?
3. How many independent countries were there at the end of 2000?
4. What is the air distance, in miles, between Paris, France and Sydney, Australia?
5. How many bones are in the human body?
6. How many total combatants were killed in World War II?
7. How many books were in the Library of Congress at the end of 2000?
8. How long, in miles, is the Amazon River?
9. How fast does the earth spin at the equator?
10. How many transistors are in the Pentium III computer processor?

For each question, a person is asked to estimate a maximum and minimum range such that they are 90 percent sure to capture the correct answer. The correct answers are (1) 250,000 pounds, (2) 1,513, (3) 191 countries, (4) 10, 543 miles, (5) 206 bones, (6) 8.3 million, (7) 18 million, (8) 4,000 miles, (9) 1,044 miles per hour, and (10) 9.5 million.⁸ If a person is 90 percent sure of their answers then at least nine of their answers should have fallen within their specified range.

However, research has shown that on tests similar to this, up to 43 percent of answers are outside the range or in other words, an estimated 90 percent accuracy is in reality only 64 percent accurate.⁹ A 1973 study found this bias to be prevalent in the military and a 1977 study found it to be prevalent in the CIA.¹⁰ This tendency toward unjustified confidence exists most prominently in questions of moderate to high difficulty. In situations where subjects gave themselves 1000:1 odds of being correct, they were in fact only correct approximately 85 percent

of the time. Giving themselves 1,000,000:1 odds, they were correct approximately 93 percent of the time. Other studies have confirmed this finding and interestingly, the opposite also holds. The less one knows about a topic, the more confident that person is in his or her knowledge of that topic and the more an individual knows about a topic the less confident they are in their estimates.¹¹

The Insensitivity to Sample Size Bias. Consider the following situation. A certain town has two hospitals. One is large where approximately 45 children a day are born. The other is small where approximately 15 children a day are born. Overall, there is approximately a 50/50 mix of boys to girls, but on certain days over 60 percent of the births are boys. Over the course of one year, will both hospitals experience approximately the same number of days when more boys are born or will one experience more and if so which one? In tests such as this, only 21 percent of subjects correctly choose the smaller hospital. Because the large hospital has a larger sample size, it is more likely to approximate the mean value of 50 percent male births.¹² Even test subjects who understand statistics fail to properly account for small sample sizes in making estimates and their resulting decisions suffer.

The Availability Bias. It is easier to recall events that are more likely to occur than events that are less likely to occur.¹³ Estimating that an event will occur when in the past it occurred 70 percent of the time, is generally a successful approach. However, a problem arises if one applies it to more than 70 percent of future scenarios which can result in an overestimate by up to 30 percent. Since it is easier to mentally recall a likely event, individuals can give too much weight to its future - likely at the expense of other possibilities.

The Illusionary Correlation Bias. This mistake appears when one attempts to correlate past events. An overzealous sports fan may assign a spurious correlation to the outcome of a game and something he or she did on game day. This is a superstition without merit and most people recognize it as such. However, it is symptomatic of the tendency to overestimate the correlation of two events if they both occurred together in the past. If a person is mugged on a rainy summer evening by someone with long dark hair then they will think that it is more dangerous to be around individuals with long dark hair on rainy summer evenings. While it may be true that evenings are more dangerous than the day time, the length and color of one's hair

may be irrelevant. In fact winter, especially around the holidays, may have a much higher incidence of muggings.¹⁴

The Retrievability of Instances Bias. A bias related to the ease of recalling a past event has to do with the size of the past event. It only seems natural that someone can better recall the few hours of their wedding ceremony than they can the few hours from their 52nd date or at someone else's wedding. This is in spite of the fact that both events may have taken the same amount of time out of their life. However, by being able to more easily recall some events over others, individuals systematically overweigh them in making judgments about the future. Research has shown that people grossly overestimate the danger of flying versus driving when in fact they have a much greater chance of death or injury while driving. This is because a plane crash is very dramatic and receives proportionally much more media attention than does a car crash.¹⁵

The Escalation Bias. Consider the following scenario. A bank loan officer approves a loan of \$50,000 to a seemingly good project. Later, the head of the project returns and states that the project is advancing well, but without an additional \$50,000 all will be lost. What should the bank loan officer decide? Credible research has shown that bank loan officers will disproportionately make the second loan disregarding the fact that the first loan is a sunk cost and the second loan decision is an independent event that should not be influenced by the first event.¹⁶ Psychologically, what is occurring is that the loan officer is unconsciously reaffirming his personal stake in his belief in the "correctness" of his earlier bad decision by "escalating" his commitment.

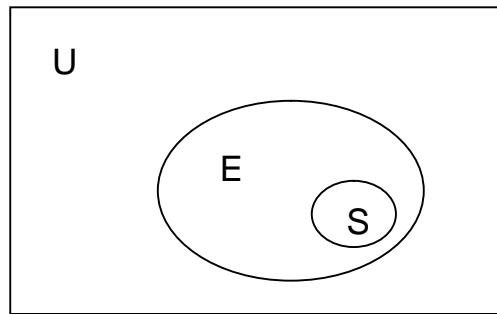
The Break Even Bias. Another bias related to associating current decisions with independent past events is the break even or seeking pride bias. Research has shown that there is a disproportionate tendency to gamble "double or nothing" or take undue risk even with unfavorable odds on a second decision when a first decision has resulted in a loss. This tendency is manifest at the horse track where long-shots on the last race of the day receive more bets than long-shots earlier in the schedule.¹⁷

The Snake Bite Bias. However, a poor first outcome does not always lead to more aggressive behavior. When a bad first decision creates a strong and significantly negative

emotional experience for a person, then they will tend to be overly cautious with future decisions. This holds true even in the face of strong positive odds for the second decision.¹⁸

The Fear of Regret Bias. Fear of regret is the opposite tendency of seeking pride. When faced with a second decision after a successful first decision, individuals will be unjustifiably cautious. Research on the stock market has shown what some would consider counter-intuitive. Investors are 50 percent more likely to sell a stock after it has risen than to sell a stock after it has fallen.¹⁹ This is in spite of the fact that selling the loser is the better decision on an after-tax basis²⁰ while other research has shown that a rising stock will often continue its rise.²¹ Everyone has experienced the situation of looking back and thinking of missed opportunities or regretting an action not taken. This is similar in that the investor will sell the stock in order to avoid regret later should the stock close lower. This deviates from rationality when all the fundamentals of the stock point to a continued rise.

The Confirmation bias. Consider the following question. What rule will yield the following numeric sequence: 2, 4, 6? In this test, subjects were allowed to generate their own sequence, for example: 8, 10, 12 or 200, 400, 600; and ask the moderator if it adhered to the rule. Subjects were asked to announce the rule only after they were sure of their findings. In taking this test a majority of subjects missed the answer at least once. In fact, a large minority, even after repeated attempts, were unable to find the rule at all. The answer is any sequence in ascending order. The reason so many people failed to decipher the rule or did so only after an initial mistake is because people tend to problem solve by forming a hypothesis and then attempting to prove it through positive examples or information that confirms it. The Venn Diagram below shows that because a subject's hypothesis is a subset of the actual rule, looking to disprove it rather than prove it would be a more efficient way of proceeding.²²



U = Universal set of all triples
 E = Experimenter's rule of all ascending
 triples
 S = Subject's rule

The Military Decision Making Process (MDMP)

The military has a specific and firmly engrained decision making process. Taught at all levels, it is rigorously adhered to and ruthlessly evaluated. This process has seven parts that include: 1.) receipt of mission, 2) mission analysis, 3) course of action (COA) development, 4) COA analysis, 5) COA comparison, 6) COA approval, and 7) orders production.

The MDMP begins with the receipt of a formal order from higher headquarters or a field commander's assessment that the higher headquarters commander's intent can be accomplished by a different means. Staff is alerted, the required tools of mission analysis such as maps, intelligence report, etc, are gathered, and any required estimates are gathered for an initial assessment. The commander will issue his initial guidance and the staff may issue a warning order that will include initial timelines, required movements and information requirements.²³ Upon receipt of the commander's initial guidance and issuance of the warning order, the staff begins the mission analysis.²⁴ This process consists of a series of clearly outlined steps that involve a review of the headquarters order, detailed risk assessment and review of the mission. A warning order will then be issued to subordinate units and the commander's planning guidance will be issued to the staff. The commander's guidance will contain his visualization/concept of the operation along with constraints on which COA's can and cannot be considered.²⁵ The staff then begins COA development. COA development is a formal process that outlines possible mission scenarios including forces and combat power needed. COA development relies heavily on brainstorming.²⁶ Once a reasonable number of feasible solutions are decided upon, the staff begins the COA analysis which essentially tests the feasibility and probability of a successful outcome using war game results. Based on the war game results, the commander decides which

COA to follow. Once a COA has been decided upon, the final stage of the Military Decision Making Process is to produce orders and disseminate them to subordinate units.²⁷

The full MDMP is used when time is not a significant constraint. However, time is often a constraint and as such, there are techniques that can be employed to decrease the time necessary to formulate and produce a workable plan. These specific techniques include:

- maximizing parallel planning so subordinate units may begin their planning by issuing as many warning orders as needed
- increasing collaborative planning with subordinate units so that they have as much information as possible, as quickly as possible
- using liaison officers to pass information as quickly as possible
- increasing the commander's involvement so that decisions may be made without detailed briefings
- limiting the number of COAs to include only one that is deemed acceptable though it may not be optimal²⁸

The danger with shortening the MDMP is that the staff will “not explore all available options when developing friendly COAs” and “it increases the risk of overlooking a key factor.”²⁹

SELECTED CASE STUDIES

Lee at Gettysburg. Generations of military officers have been trained on the strategy and tactics of this decisive battle. It is one of the most studied battles in American history and is therefore a good reference point for looking at the psychology of command and the significant role cognitive biases can play in war. The battle was fought in the summer of 1863, more than two years into the Civil War. Robert E. Lee was the commander of the Confederate forces and, up to this point, had a long and successful career. He had successfully turned back General McClellan near Richmond and won a smashing victory at the Second Battle of Bull Run. At Antietam Lee was badly outnumbered, and although he lost the element of surprise and ultimately failed to achieve his objective, he was, nonetheless, able to prevent the destruction of his army and inflict high casualties on the opposing Union force - resulting in the dismissal of its commander. Lee had also been successful at Fredericksburg and Chancellorsville in December 1862 and May 1863 respectively.

The Battle of Gettysburg lasted for three days. The first day began with cavalry clashes to the west of Gettysburg and ended with significant fighting between the two opposing armies. At the end of the first day of fighting, the Confederate Army seized control of the town proper and established positions along Seminary Ridge to the southwest of Gettysburg. The Northern Army took up defensive positions along Cemetery Ridge due south of the town. The second day saw heavy fighting as the Confederates defeated the Union forces of General Sickles and pushed them back to Cemetery Ridge. The third day saw the fateful attack of the Confederates across a long open field against the center of the Union forces which possessed artillery superiority. The Confederate forces were repulsed with heavy losses and as his troops returned from the field Robert E. Lee is quoted as saying “It was all my fault this time.”³⁰

Many historians and military officers have asked how and why General Meade won and General Lee lost. Why did a successful veteran such as Lee commit his forces to a “suicidal and ill-fated attack?”³¹ The required text used to train generations of future commanders from West Point and overseen by the former Dean of Cadets, Brigadier General Roy K. Flint, in critiquing Lee at Gettysburg states that he had a “fatal flaw – he tended to underestimate his opponent.”³² In essence, Lee overestimated his own capabilities. The West Point text alludes to another issue with psychological implications. It states that “Chancellorsville appeared to be his model for victory, while Fredericksburg was locked somewhere in the recesses of his mind.”³³ Lee was a master of the offense, but Fredericksburg was a battle of immense carnage that clearly showed the advantage of the defense. The implication here is that General Lee suffered from the confirmation bias. In a separate study, a psychologist and a historian, Robert Pois and Philip Langer, teamed up and agree with the West Point findings. They conclude that General Lee “could not and would not admit to himself at any time during the three days that the battle would not in the end be successfully resolved by his personal touch.”³⁴ What they call “psychological rigidity” leads to confidence not born of “an accurate and thorough appraisal of one’s situation”³⁵ and can lead to failure when “a fixed conviction as to the ultimate success of ones undertakings may sharply decrease the possibility of seriously considering options dissonant from those envisaged by one’s fond hopes.”³⁶

McClellan in Virginia. George McClellan was a West Point graduate who had experience in both the Mexican War and as a military observer of the Crimean War. After approximately ten years of service, he left the Army and became a railroad president. At the

onset of the Civil War he returned to uniformed service and received media praise after a series of small victories in West Virginia. Given that Abraham Lincoln was searching for a commander for the Army of the Potomac who could deliver victories, McClellan gained Lincoln's attention with his background and reputation, and quickly rose to become the Commander of the Army of the Potomac.³⁷ Under significant political pressure to take the fight to the south, McClellan set out to capture the Confederate capital of Richmond.

McClellan's plan was to land forces at Yorktown and proceed on Richmond. The landing at Yorktown took place on April 5, 1862, however, Yorktown was not secured until May 4. McClellan advanced at a slow pace and finally reached the vicinity of Richmond on May 25. Once there, he began to methodically plan his attack. However, on June 26 the Confederates struck first and McClellan was forced to withdraw to Harrison's landing in what would become known as the Seven Days' Battles. The result McClellan's indecision was that his army was forced into a small defensive pocket by a force that was smaller and less well equipped.³⁸

What could cause a larger and better equipped army to move so slowly and lose to a force inferior in manpower and material? The West Point text reflects the feelings of both Abraham Lincoln and subsequent historians that McClellan was timid.³⁹ This seems unlikely for someone who was professionally trained as a soldier and who had achieved victories in West Virginia. Pois and Langer couch it in psychological terms. They claim he had a fear of failure similar to what was described earlier as a fear of regret. He was less concerned with winning than he was with avoiding failure.⁴⁰

ANALYSIS

The MDMP. The military decision making process is a robust and proven method for rational choice but it is not perfect. For the model to work perfectly commanders and staff would need to fulfill the below criteria:⁴¹

- Accurately define the mission
- Accurately assess the enemy and friendly situation
- Identify all alternatives
- Identify all criteria
- Accurately weigh all criteria
- Accurately assess each course of action

- Correctly make a decision based on a COA comparison

In real world circumstances, human judgment with ingrained heuristics and their associated biases affect final decisions. For example, the confirmation bias could affect the assessment of the enemy and friendly situation. The availability bias could adversely affect the identification of possible COAs and the representativeness bias could adversely affect the identification of criteria. The weighing of each COA could suffer from the illusionary correlation bias. Overconfidence or insensitivity to sample size could affect the COA comparison and the final decision made by the commander could be affected by the escalation, break-even, snake-bite or fear of regret biases.

Selected Best Practices. The use of applied psychology is widespread in professional, college and Olympic athletics. The psychologist works with the athlete to improve their concentration, confidence, control and commitment through techniques such as relaxation, centering and mental imagery. Increased concentration allows for focus despite distractions such as fatigue, anxiety, weather and negative thoughts. Confidence allows one to persevere despite difficult odds, be positive and share in responsibility. Control allows for mitigating the negative affects of emotion on concentration. Commitment allows one to remain on task over extended periods of time despite problems such as anxiety, injury, boredom, lack of enjoyment, or perceived lack of progress.⁴²

The high stakes and high stress world of hedge funds and stock trading are increasingly using applied psychologists to increase performance. SAC Capital, with over \$12 billion in assets, is one of the largest, best known and most successful hedge funds in the world. SAC Capital charges the highest fees in the industry and as such is often viewed as an industry bellwether. Working at a hedge fund is one of the highest paying and most sought after jobs. Hedge funds have their pick of employees and hire only the brightest people from the best schools, all of whom have distinguished records of achievement. Last year the *Wall Street Journal* reported that SAC Capital maintained a psychologist on staff. SAC Capital's psychologist Dr. Ari Kiev says that "Most people trade with the notion of avoiding failure."⁴³ His role is to help these highly educated, motivated and accomplished individuals overcome cognitive biases and achieve increased performance.

The broader investment community also makes use of applied psychology at the highest levels. The investment committees of major mutual funds make decisions regarding tens of

millions of dollars and the results of their decisions will become unambiguously apparent in the form of a percentage return on investment. These extremely successful powerbrokers recognize the shortcomings of some individual and group processes and use effective techniques to mitigate the impact. For example, the chairman of the investment committee will not predispose the group by giving his opinion before different options, or courses of action, are formulated. Secret balloting is also used to determine the best course of action. The chairman does not relinquish control, but simply uses various techniques to lay out the best options before him.⁴⁴

Outside the financial industry, corporate CEOs use “professional coaches” to enhance personal performance. These coaches are in fact trained psychologists who work with some of the most successful and highly performing individuals in the country on issues such as anxiety, fear, lack of confidence and emotional control.

West Point - and increasingly the broader Army - is beginning to recognize the benefits of applied psychology. The Academy’s Center for Enhanced Performance was founded in 1989 and began by working with intercollegiate athletic teams. Shortly afterwards, they branched out to help cadets improve their academic and leadership skills. Recently, they have helped units around the Army prepare for real-world missions. These units have included Recruiting Command, marksmanship units, Stryker brigades and the 3rd ID prior to a deployment to Iraq. They use techniques similar to those for athletes to help maintain focus, concentration and confidence in highly stressful and demanding situations⁴⁵.

Recommendations. Military decision making occurs at many levels simultaneously. Below is a nonexhaustive list of ideas that could be easily implemented to help address some of the current shortcomings of the military decision making process.

- **Research.** The officer corps that comprises the majority of planning staffs and commanders is a fairly homogenous group especially regarding age, educational background and work related experiences. Targeted research should be conducted to determine exactly which cognitive biases exist among this demographic and the degree to which they exist. This is an important step in more clearly defining the problem.
- **Education.** One of the strengths of the military is that the planning culture is engrained early and reinforced often. One shortcoming of this education is that heuristics and

cognitive biases are not adequately addressed. Instruction in these areas should be incorporated into the leadership and decision-making training beginning with pre-commissioning and continuing through the basic course, captain's course, the Command and General Staff College and the War College. The first step in overcoming biases is to understand them so that they can be recognized and mitigated.

- **Procedural.** One of the strengths of the MDMP is that it is standardized. That strength could be capitalized upon by incorporating a few additional steps to address cognitive biases. As part of the quality control for each step, a matrix or checklist could be incorporated to address those biases most prevalent at each stage and assess the factors that may contribute to its presence and strength. For example, the option of having a “red teamer” or someone to provide a critique to the commander could be formalized.
- **Training.** Another strength of our military is its realistic training and quick feedback. An observer-controller familiar with performance enhancement and applied psychology should be assigned to the Combat Training Centers, the Battle Command Training Center or any other high level war game where commands and planning staffs are evaluated. This option could be easily implemented and would provide targeted feedback where it is most valuable – to the commanders and staffs of the largest operational units.
- **Organizational.** To fully internalize the lessons and best practices that performance enhancement has to offer, an officer familiar with the issues should be assigned to the major commands. That person would serve as a coach to the commander as well as trainer to, and objective observer of, staff planning. An ongoing trusted relationship with the commander and staff would help this officer ensure the lessons learned in training are carried forward during combat operations.

Conclusion

The Army has a robust and proven tool in the seven-step Military Decision Making Process. However, this tool has some inherent weaknesses in that it depends on the estimates, judgments and decisions of imperfect humans. Furthermore, these weaknesses are exacerbated at the most critical times such as decision-making during combat operations when there is fatigue, stress, limited time and incomplete information. While acknowledging bias, the Military

Decision Making Process fails in any meaningful way to account for them. Current research in the fields of applied psychology and behavioral economics have shed light on how the human brain makes judgment and related cognitive biases namely: overconfidence, insensitivity to sample size, availability, illusionary correlation, retrievability of instances, escalation, break even, snake bite, fear of regret, and the confirmation bias. There are sufficient historic examples of military failures stemming from individual cognitive bias and flawed decision-making including Lee at Gettysburg and McClellan in the Peninsular Campaign. Industry, especially professional sports and investment management, has applied these findings with success. The Army and military in general could improve its decision making process by incorporating these research findings and industry best practices. These changes could include not only research, education, and training, but also procedural and organizational changes. By doing this the Army may be able to avoid mistakes in the future and enhance its ability to successfully meet its mission of fighting and winning the nation's wars.

Endnotes

¹ Max Bazerman, *Judgment in Managerial Decision Making* (New York: John Wiley & Sons, 1986), 8.

² Ibid., 7.

³ Lee Roy Beach and Terry Connolly, *The Psychology of Decision Making* (Thousand Oaks: Sage Publications, 2005), 82.

⁴ Bazerman, 7.

⁵ Beach, 82.

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